

# How Species Persist and Spread

The many species of plants and animals inhabiting the earth do not often remain in the same location indefinitely; indeed, given the drastic changes that occur in climate, most terrestrial species would face inevitable extinction without the ability to adapt to new challenges or disperse to new areas. For a species to persist after a habitat change, it must have the (1) **physiological potential** to survive and reproduce in the altered habitat. Before a species can successfully spread into a new area, it must meet the same physiological-potential criterion, plus at least two other major conditions: it must have the (2) **ecological opportunity** to become established in the new area, and it must have (3) **physical access** to it.

## (1) The importance of physiological potential

Any new area into which colonizing members of a species move, as well as any habitat undergoing an ecological change, will differ to some degree from the area these species members are used to. Hence the population will immediately be subject to selection pressure for evolution of better adaptations for the new environment. But since such evolutionary improvement comes after ecological change or colonization, survival or colonization itself is possible only if individuals are already at least minimally preadapted for survival under the new environmental conditions.

**Preadapted** does not imply any intentional preparation for an ecological change or the move into strange territory; it simply means that characteristics an organism has evolved in the previous habitat are at least minimally suited to the new habitat. For example, colonizers must be able to use some source of food in a new area, and they must be able to withstand the rigors of the new climate.

## (2) The need for ecological opportunity

A colonizing species must encounter little competition or danger from natural enemies when it first reaches a new area. There must be underutilized resources it can exploit. The reason is simple: even if the colonizer has the physiological potential for surviving in the new habitat, chances are that it will be less well adapted to the new conditions than species that have been in the area longer. If the niche of one of the established species is very similar to potential niches of the colonizer, the established species will probably have the competitive advantage and be able to prevent the colonizer from taking hold. But if conditions in the new range are very similar to those in the old, a colonizing species may sometimes be competitively superior to an established species and be able to supplant it.

## (3) The ability to disperse

It is useless for a species to have the physiological potential and ecological opportunity for surviving in a new range if it has no way of getting there. Doubtless many common North American mammals could survive and prosper in Australia, but unless they have some way of reaching that continent, this potential range extension will remain unrealized.

There are many ways organisms may disperse or be dispersed from one place to another. Most obvious for many animals is active locomotion: walking, crawling, swimming, or flying. Even many sedentary marine animals have a free-swimming larval stage. Active locomotion may carry the members of a single generation only a short distance from their point of origin, but over many generations the cumulative effect may spread the species over hundreds or thousands of kilometers. All the plant and animal species now present in the regions covered by glaciers 15,000 years

ago recolonized these regions over the course of a few dozen centuries.

For plants and for many very small animals, passive transport is more important than active locomotion. For example, the seeds or spores of many plants may be blown great distances, and insects, spiders, and other invertebrates have been known to be blown hundreds of kilometers by storms. Pilots sometimes encounter large numbers of insects being swept along by fast-moving air currents at high altitudes. Aquatic organisms may similarly be swept along by water currents. Even some fairly large terrestrial plants and animals may be carried across many kilometers of water on floating logs or rafts of matted vegetation. Many such logs and rafts are swept out to sea by large rivers like the Amazon and the Congo, particularly during floods. A raft about 100 m<sup>2</sup>, composed of soil and decaying organic matter laced together by roots, was sighted in the Atlantic Ocean off the coast of North America in 1892. Many shrubs and several trees 10 m tall were growing on it. This raft, which looked like a floating island, had drifted at least 1600 km.

Some plants and small animals are dispersed by birds and mammals. For example, the seeds of many plants pass through the digestive tracts of higher animals without being harmed, and may germinate and grow if the animals' feces are deposited in a favorable place; indeed, some seeds will not germinate without first passing through a vertebrate gut. Edible fruits tempt vertebrates to eat them, disperse their seeds and, when defecating, even supply fertilizer; the laxative effect of fruit may be adaptive in that it gets the seeds out of the gut before they are damaged by digestive enzymes. Birds sometimes transport seeds long distances in this way. Plant seeds and the eggs and larvae of some small aquatic animals may be transported on the feathers or feet of swimming or wading birds.

**From:** Gould, James L. and William T. Keeton with Carol Grant Gould. 1996. *Biological Science*. 6<sup>th</sup> Edition. W. W. Norton & Company, New York. Pages 1197-1198, 1199-1200, 1201-1202.

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